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Compliments of the Author.

Drainage after Laparotomy.

BY

PAUL F. MUNDÉ, M.D.,

Professor of Gynecology at the New York Polyclinic,
Gynecologist at Mount Sinai Hospital.

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DRAINAGE AFTER LAPAROTOMY.

BY PAUL F. MUNDÉ, M. D.,
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WHILE in general surgery the drainage of a cavity which is discharging or is likely to secrete is an established therapeutical principle, the same does not apply to abdominal surgery. I was surprised to find, in looking over the literature and reviewing my recollections of the operations I had seen performed by many of the celebrated European laparotomists, how great a difference of opinion exists as to the necessity and even justifiability of abdominal drainage after the removal of adherent abdomino-pelvic tumors, some operators always inserting the drainage-tube in such cases, and others, equally successful, rarely or never using it.

Thus, Billroth (fifty-one successive ovariotomies, with drainage in fifty), Bardenheuer, Winkler (both of whom advised drainage after every ovariotomy—the latter as late as 1880, the former in 1876) are almost unqualified advocates of abdominal drainage; Winckel, Hegar, Kaltenbach, Keith, Bantock, Thornton, Spencer Wells, Schroeder, Thomas, and the majority of present laparotomists employ it in cases where there were extensive adhesions, and consequent oozing is to be expected, or where purulent or other infectious fluids from the cyst escaped into the peritoneal cavity during the operation; and Olshausen, Martin, Esmarch, Goodell, Péan, Tait, and Miculicz prefer, in the large majority of instances, to close the abdominal wound entirely after having thoroughly cleansed the cavity by sponging and irrigation, and arrested all oozing.

To quote briefly from several of the authors referred to,

Hegar[1] says: "If the attempts to check intra-peritoneal oozing are so ineffectual that the sponges passed into Douglass's pouch return still soaked in blood after being inserted eight or ten times, or if viscid cystic fluid or traumatic exudation from large intra-peritoneal wounds, especially of the cellular tissue (broad ligament), is added to the blood, we consider drainage called for. Quite indispensable is it if during the operation directly infectious substances—pus or putrid fluid from ruptured cysts—have entered the abdominal cavity; if intestine, bladder, or ureters have been injured, and the escape of feces or urine can not be securely prevented by suture; finally, if larger secreting portions of the cyst-wall or frequently-ligated remains of a friable solid tumor have of necessity been left behind, which inevitably must become gangrenous.

"But we omit drainage when but a small quantity of bloody serum or clear blood is slowly oozing from severed adhesions, and the peritoneum shows no other extensive textural changes. Even a pre-existing ascites or the temporary escape of benign thin cystic fluid into the peritoneal cavity would, if the hemorrhagic oozing is stopped, be no sufficient reason for drainage."

Tait is much more sparing in his use of drainage, but I have seen him insert the tube after removing a small adherent dermoid cyst, there being quite free bloody oozing; and he expresses himself in his book[2] as follows: "I have now had considerable personal experience of this method, and I am quite satisfied, from the cases in which I have used it, . . . that there will occur every now and then a severe case in which it will be found absolutely necessary to employ it."

Olshausen is perhaps the most uncompromising opponent of drainage after laparotomy, for he says, in the last edition of his book, "I have never,[3] with the exception of a short period when I treated twenty-nine cases by drainage, made

[1] *Operative Gynaekologie*, 1881, from which work, with that of Olshausen, *Krankheiten der Ovarian*, many of my references are taken.

[2] *Disease of the Ovaries*, 1883, p. 314, *et seq.* [3] *Loc. cit.*, p. 572.

extensive use of the method, and since July, 1882, I have not drained in any case of completed or uncompleted ovariotomy, although many complicated and unclean cases occurred to me in which frequently the condition of the patient prevented careful toilet of the peritoneum. The two last patients treated with drainage died of septicemia. Since then, of one hundred and twenty-four ovariotomies, not one died of septic infection."

Even in cases of enucleation of large subserous or intraligamentous tumors, from the bed of which oozing is more than probable, Olshausen advises against drainage, preferring to stop oozing by pressure, and, after thoroughly cleansing the cavity by sponges dipped in carbolized water, to leave it open, and to completely close the abdominal wound.[1]

His objections to drainage are secondary septic infection, tedious suppuration, and an abdominal fistula which may persist for years. These dangers are in his opinion much greater than the possible formation of a pelvic cellular exudation, which very rarely threatens life.

In Martin's clinic I have seen reconvalescent cases of whom he told me that he had peeled loose extensively adherent tubes and ovaries, and when I asked him whether he had used drainage, he replied, No, that he had laid the intestines over the raw bed of the tumors, and that they acted as a hemostatic tampon. The results certainly justified his expectations.

Goodell says:[2] "The drainage-tube is not a favorite of mine, and I try to dispense with it whenever I can. It is only in cases in which oozing goes on and the peritoneal cavity cannot be kept clean that I resort to drainage."

A pretty extensive experience with drainage after laparotomy, and the rather conflicting and not always favorable results of its use,[3] have for some time excited within me a

[1] *Loc. cit.*, p. 564.

[2] "A Year's Work in Ovariotomy." *Medical News*, Jan. 29, 1887.

[3] In 60 laparotomies, I used drainage in 23 cases—of these 12 died. Of the other 37, in which no drainage was employed, only 3 died. In this respect my

question as to whether drainage could not be reduced to a minimum, and restricted to cases in which a gradual closure of the non-removable ovarian sac by granulation was the only means of cure. I refer solely to drainage through the abdominal wall, since I believe the results of abdomino-vaginal drainage to have been in most hands (those of Martin after laparo-hysterectomy for fibroids perhaps excepted) anything but favorable. Indeed, if I refer to vaginal drainage in this paper, it will be merely to make this brief reference to its history, but chiefly to offer a suggestion in regard to its possible substitution for the abdominal method in the exceptional cases where drainage seems indispensable.

The questions which would seem to me to require reply in this inquiry are the following:

1. In what class of cases does drainage theoretically seem necessary?

2. What are the advantages of drainage?

3. What are the dangers and disadvantages of drainage?

4. What form of drainage is the best and least dangerous?

5. What substitute can be offered for drainage; or how can the necessity for its employment be averted?

I do not intend to enter into a long discussion of these various questions, but will endeavor to answer them from my own experience and that of others as briefly as possible.

1. The credit for having first introduced abdominal drainage by means of glass tubes into practice for the purpose of permitting the escape and removal of blood and serum after ovariotomy, is universally conceded to Dr. E. R. Peaslee. Subsequently, he also used the tubes as a means of permitting irrigation of the peritoneal cavity.

This same object, the removal of blood, serum, and

experience resembles that of Dr. C. J. Cullingworth (*Lancet*, paper read before the Manchester Med. Soc., Feb. 2, 1887), who drained in 22 out of 37 cases, and lost 5 out of the 22, while the 15 that were not drained recovered. He says, quite truly, however, that these results afford no argument against the value of drainage, since it was only used in the more serious cases. Undoubtedly this is true, but may not a serious case be rendered more so, at times, by the irritation of a drainage-tube?

eventually pus, from the peritoneal cavity, has been the indication for the introduction of a drainage-tube ever since.

It is a surgical rule that whatever fluids might subsequently decompose in a wound or cavity and cause general septic infection, should be removed at once or be given free opportunity to escape as soon as secreted. While theoretically, no doubt, this principle should hold good in abdominal surgery, practically it does not always seem necessary to enforce it. Such fluids are most likely to be secreted whenever extensive adhesions have been separated without being ligated, when the peritoneal cavity has been unusually irritated by sponging, handling, and exposure, and chiefly when noxious and infectious fluids (pus, thick, colloid cyst fluids) have escaped into it.

Theoretically, the unavoidable exposure of the abdominal viscera to the atmosphere and the organisms supposed to be suspended in it, would entail the putrid decomposition of the intra-peritoneal fluids and their absorption into the general system, therefore septicemia. The difference between the fluid-pressure in the intestines and the general arterial and lymphatic system on the one hand, and the free peritoneal cavity on the other hand, no doubt greatly influences this absorption. Hence, of course, the vital indication to so sterilize the atmosphere about the patient, as well as all substances coming in contact with her absorbents as to remove all danger of infection. If this can be done—that is, if modern antisepsis can prevent the decomposition of free fluid in the peritoneal cavity after it is closed during a laparotomy—why, then, the removal of that fluid by drainage may generally be dispensed with, since experience has shown us that a small quantity of free blood, serum, clear ovarian cystic fluid, and even a laudable pus, is readily disposed of by the peritoneal absorbents without injury to the general system. So long, however, as there is the slightest doubt as to the possibility of antisepsis achieving this result, so long will, theoretically at least, drainage be called for whenever the conditions above described exist.

2. *What are the advantages of drainage?* Obviously the removal of intra-abdominal fluids which by subsequent decomposition *may* cause septicemia. If such fluids actually are present, and such decomposition really takes place, there can be evidently no question not only as to the justifiability of drainage, but its omission would be criminal negligence.

3. *What are the dangers and disadvantages of drainage?* In considering this question, I will premise that it has always seemed to me one of the most curious and surprising phenomena of the many which our recent experiences with laparotomy has taught us, that a glass, hard- or soft-rubber tube can be inserted into the peritoneal cavity in immediate contact with the moving and delicate intestines, can be kept there for days and weeks, exposing more or less (in spite of antiseptic dressing) the sensitive peritoneum to external infection—and still such treatment prove not only not injurious, but positively life-saving. In this respect, abdominal drainage seems to me widely different from and vastly more dangerous than ordinary surgical drainage of an external wound. It is true, this immediate contact with the free peritoneum lasts but a short time, for adhesive inflammation soon throws out a wall of lymph about the drainage-tube which binds together the intestines and entirely closes the peritoneal cavity proper to external influences. I have seen this wall of lymph as early as forty-eight hours after the operation in two cases, where I was obliged by septic symptoms to reopen the abdominal wound; the tube lay loose in a complete canal of fresh exudation, and repeatedly have I felt it with my finger on removing the tube later on.

But, before this lymph is exuded and non-absorbent granulations spring up, sufficient time has elapsed and opportunity been given for septic infection and absorption, and further, when this canal has been formed, drainage is practically useless because the peritoneal cavity is closed, and only the fluid secreted by the drainage-track can be removed.

I confess that, while from our present standpoint I recognize the necessity for and utility of drainage under the indi-

cations referred to, I have always felt that the impossibility of completely closing the abdominal wound seemed to me to add greatly to the dangers of the operation. I have drained because I thought I ought to; because I believed in following the maxim: When in doubt, drain! But I have always wished most fervently that the necessity therefor could have been avoided, and have never felt easy about my patient until I was able to remove the tube after several days, with normal pulse and temperature. How different the sensations and the outlook when the abdominal wound was hermetically sealed at once, not to be inspected until the stitches were removed! And this feeling of security was not due wholly to the fact that the absence of adhesions and discharge did not require a drainage-tube, for of late I have had several experiences where I did not drain, although the adhesions seemed to call for it, and where I formerly would have done so; and still recovery was uninterrupted. I admit that I have several times been deeply thankful that I decided to drain, on removing six or eight ounces of bloody serum twelve or eighteen hours after the operation. The thoughts of the damage this fluid *might* have done, if it had been retained, made me shudder. But, *would* it have done so much damage? That is the question! Aside from this doubt as to whether the drainage-tube *might* not have been dispensed with, come various annoyances and dangers connected with, and possibly arising from, its use; such as, the annoyance and anxiety to the patient of having her dressings opened and seeing bloody fluid withdrawn from the abdomen, and of knowing that everything is not quite right with her so long as this frequent handling is necessary; further, the undoubted danger of traumatic peritonitis produced by the irritation of the tube, the possibility of septic infection from the tube-canal, in spite of antiseptic precautions, and of intestinal adhesions and obstructions unquestionably increased by localized peritonitis.

I may be wrong; but several of my unfortunate cases, in which constipation, tympanites, and vomiting set in a few

days after the operation while the tube (introduced for expected oozing) was in place, and where neither temperature nor pulse indicated septic infection, but the autopsy showed localized purulent peritonitis, have raised in me the suspicion that the tube acted as an irritant, and that the cases would have done well if the abdomen had been completely closed and the subsequently effused blood (if any) allowed to take care of itself. In such cases of clean detachment of diffuse adhesions (as in intra-ligamentous cysts), where nothing but bloody or serous oozing is to be expected, I feel disposed hereafter to postpone closing the abdominal wound until, by careful removal of coagula and fluids with sponges, and arrest of oozing by packing the bleeding surface with gauze or large sponges, all chances of subsequent secretion are removed, and then to close the wound hermetically.

I will not as yet go so far as to say, with Olshausen,[1] that "drainage, even in unclean operations, is superfluous or injurious, and it is possible, with almost absolute certainty, to exclude infection during the operation"; but I think I shall henceforth employ it less frequently than heretofore.

There is a source of danger from a drainage-tube in the peritoneal cavity which I do not remember seeing or hearing referred to, namely, the reflex gastric irritation, apparently produced by the tube. At least, I can only explain the cessation of vomiting on removal of the tube in a recent case in this manner:

On June 19th last, I removed both ovaries and tubes for hematoma of the ovaries, the anesthetic being chloroform. The adhesions were complete, but recent; still both cysts ruptured, and the grumous, not offensive, fluid escaped into the peritoneal cavity, which was thoroughly washed out with Thiersch's solution, poured in from a pitcher, and a glass drainage-tube was then introduced. The stomach had been in excellent condition before the operation, but on the following day vomiting began, which persisted in spite of oxalate of cerium, cocaine, mustard to epigastrium, etc. On the third day the

[1] *Loc. cit.*, p. 573.

temperature rose to 101°, the pulse to 120, and the patient began to assume the anxious, haggard expression which I always look upon as denoting the inception of septic infection. Fortunately there was no tympanites. The fluid from the tube was at first dark blood, about two ounces; on the third day, at noon, slightly bloody, inoffensive serum, about three ounces being withdrawn with the syringe. The complaint of the patient that the suction of the syringe always seemed to excite nausea, and the fact that each removal of fluid was followed by an attack of vomiting, gave me the idea that the latter might be reflex. Feeling sure that, unless the vomiting were soon checked, the patient would do badly, I preferred to risk leaving a certain quantity of tinged serum in the peritoneal cavity to continuing the probable reflex irritation of the tube, and removed it. The patient vomited once more, about half an hour after the removal, doubtless still reflex, and then no more, and went on to a rapid recovery.

The harmlessness of a few ounces of serum in the peritoneal cavity was thus also demonstrated by this case.

I believe that whatever good a drainage-tube does is generally accomplished within forty-eight hours, so long as the effused fluid is pure blood or pus. As soon as it becomes merely serum, even if slightly sanguinolent, the tube should be removed, as likely to irritate and excite local inflammation. I am sure I have usually left the tube in too long, fearing to remove it so long as there was the least secretion.

Besides these immediate dangers from drainage there are other more remote results, among which the long continuance of an abdominal fistula is most prominent. Such fistulæ may persist for months, and cause the patient much pain and the physician great annoyance by their unwillingness to heal. The abdominal cicatrix always remains weak and liable to stretch at the point of drainage, necessitating long-continued strapping and careful bandaging to prevent the formation of that most distressing and (otherwise than by laparotomy) incurable accident, a ventral hernia.

4. *What form of drainage is the best and least dangerous?* The least complicated and least likely to irritate or become occluded is the best form of drainage-tube. Those of glass, devised by Thomas, of different sizes, lengths, and curves, to correspond to the depth and shape of Douglas's pouch and the thickness of the abdominal wall, are the most simple and most serviceable.

Those of Keith, Hegar, and others are perforated at the sides, but these side-openings are unnecessary, and may even prove dangerous by the tendency of the omentum or small intestine to be sucked into them and be injured when the tube is withdrawn. A very useful double drainage-tube of hard rubber has been devised by Dr. H. Marion-Sims for the purpose of permitting intra-abdominal irrigation. The afferent tube is small, but the efferent tube large to permit shreds and coagula to be washed out. All these tubes had best be of glass, for the sake of perfect cleanliness, except that of Sims, which is too liable to break unless made of hard rubber. I had one made of glass, but it became stopped up, and, on attempting to clean it, the thin afferent tube was broken. The chief objection to the Sims tube is its complicated structure, and liability to become obstructed. Besides, as I look upon the matter at present, it is not needed, except in cases of very profuse putrid secretion, where practically permanent irrigation is required. Most laparotomists nowadays believe secondary intra-peritoneal irrigation to be dangerous, as liable to break up fresh adhesions, and irritate the peritoneal cavity.

Soft-rubber drainage-tubes would answer very well, being, of course, used only once; but they are more irritating, and, above all, less easy to keep clean. A novel form of drainage has recently been introduced by Miculicz, of Cracow. It consists of a strip of iodoform gauze placed into Douglas's pouch and carried out of the abdominal wound, which is closed around it; this strip ensures free capillary drainage, and is gradually withdrawn as the secretion diminishes. It is claimed to be non-irritating and perfectly effi-

cient. To prevent soiling the dressing by the exuded fluid and prevent the entrance of germs into the tube, Keith covers the mouth of the tube with carbolized sponges, and folds over these the flaps of a rubber cloth, covering the abdomen through which the tube is passed. Hegar keeps a stylet wrapped with carbolized cotton in the tube, and closes the mouth of the latter with cotton and protective. The tube is cleaned by repeated introduction, at intervals, of cotton-wrapped stylets, and immediately sealed again with cotton. Tait draws up the fluid from the tube with a long syringe with air-bulb. I have long used a long-nozzled, hard-rubber syringe, with a piece of rubber tubing attached, to draw up the fluid, and have always dusted iodoform freely into the tube before closing it again with a plug of iodoform gauze.

The first inspection of the tube for fluid need rarely be made earlier than twelve hours after the operation, and the frequency of the removal of the fluid depends entirely upon the rapidity and amount of its secretion. Thus it may be necessary to withdraw it hourly, or only two or three times in the twenty-four hours. Tait speaks of Keith showing him three large bottles containing ten to twelve pints of fluid drained from one patient. Ordinarily, the amount varies from six to twenty-four ounces in the first twenty-four hours, and gradually diminishes. At first it often is clear or dark blood, later on bloody serum, and finally clear serum. I have never seen more than four ounces of pure blood removed by the syringe at one examination.

To avoid the danger of pressing on the projecting flanged end of the tube and pushing the other end against the bottom of Douglas's pouch, I have for several years protected it by placing a little wire cage over it, the mask used to administer chloroform being the one which first gave me the idea.

The tube is removed when the secretion is so slight as to be innocuous (exactly *when* that is the case is as yet the question), usually after forty-eight to ninety-six hours. I am inclined to think that the tubes are often left in too long. The lymph-surrounded canal in which the tube sat closes

gradually by granulation (often very slowly), the skin being rapidly approximated and held in apposition by adhesive plaster as soon as the tube is withdrawn. I have lately adopted the precaution, in order to prevent gaping and hasten union of the edges of the tube canal, to insert a deep suture during the operation at the spot where the tube was to be placed, pushing it gently aside with the tube and tying its ends loosely; when the tube was removed, the ends of the suture were tied tightly, and the wound was thus securely closed.

I need hardly say that the usual spot at which the tube is introduced is in the lower angle of the abdominal incision, nearest the posterior surface of the uterus. This, then, is the point most to be watched and supported in order to prevent a subsequent hernia. Occasionally two drainage-tubes need to be used, one in Douglas's pouch, the other in the vesico-uterine fossa, or in an adherent, non-removable cyst.

While I am to a certain extent disposed to agree with Olshausen in his condemnation of drainage so far as it applies to tubes inserted into the peritoneal cavity after ovariotomy, I can not support him when he advises against sewing the sac of an unremovable cyst to the abdominal wall, with subsequent drainage. Indeed, I confess that I do not comprehend his objections to this, as it seems to me, most rational and successful practice. Surely he cannot expect an open remnant of a cyst, with its secreting surface, to shrivel or remain dormant in the peritoneal cavity! I have had such excellent results with stitching large sacs of universally adherent ovarian cysts, or of broad ligament cysts, to the abdominal wound, and packing the cavity with iodoform gauze, and allowing it to granulate up, that I cannot imagine a better and safer plan. It is true that it takes several months for such a large sac to fill up, but the patient is able to be about after the first two or three weeks, and, except the daily dressing by irrigation and packing with iodoform or sublimate gauze, suffers no inconvenience from the open wound. Thus, several years ago, a cyst of the broad ligament, con-

taining nearly fifty pounds of fluid, was treated in this way, and the sac which at first extended from the diaphragm to the pelvic floor and from ilium to ilium, slowly filled up and contracted, not being completely closed until four months after the operation. But the patient was about most of this time, and went home long before complete closure took place.

Recently, in a case where five years before Prof. Kuester of Berlin had first removed an ovarian cyst of the right side, and six months later the left ovary also for a cyst, and where the patient presented herself for a large ventral hernia produced by a fluctuating pelveo-abdominal tumor on the left side, I found that this tumor was dermoid and intra-ligamentous, and its sac therefore irremovable. I enucleated the cyst wall itself from the enclosing greatly thickened peritoneum, stitched the latter to the abdominal wound, and packed the freely bleeding cavity with iodoform gauze. Recovery was uninterrupted.

This is only the third case which I have been able to find reported in which laparotomy has been three times performed on the same patient; but it is the only case in which the operation was done three times for cystic degeneration of the pelvic organs. Olshausen reports one case by Baumgærtner and one by himself, but in both cases the repetition of the laparotomy was called for by painful adhesions and incomplete removal of double hydrosalpinx, respectively, not by cystic disease. In my case, the history of the previous operations was contained in a copy from the Berlin clinic; and the third cyst was unconnected with the entirely loose abdominal wall, in immediate contact with the uterus, and there was no trace of either ovary. I am at a loss to explain its origin, unless it was a dermoid cyst of the parovarium, of which particular location for dermoids I find no mention in literature.

After this brief digression, I will return to the last variety of drainage of which I propose to speak, that of capillary drainage by means of a strip of iodoform or sublimate gauze placed lightly between the intestines at the most dependent

point of the pelvic or abdominal cavity, and carried out of the lower angle of the wound, the remainder of which is sutured as usual. This strip of gauze is gently drawn upon every day, the amount of discharge being noted; and, as the discharge ceases, the gauze if loose is removed and the wound closed. Fritsch and Miculicz have recommended this method of drainage very highly, as also the packing of irremovable cysts with a sac of iodoform gauze, which is gently pushed into the recesses of the cavity and loosely filled with pledgets of iodoformed gauze. This sac may be left undisturbed for a week or ten days, and is then to be removed by at first picking out the pieces of gauze in the center, and then gently drawing out the enveloping sac if it is found perfectly loose. A clean, granulating cavity will then be found, which is to be irrigated and loosely filled with iodoformed gauze or carbolated or borated cotton every two or three days or oftener (according to amount of secretion) until it closes by granulation. I have never tried the loose strip of gauze method, but have this summer treated most easily and effectually one case of completely adherent ovarian cyst by the gauze-sac drainage:

The cyst contained about six quarts of dark, flocculent fluid, and a large mass of very vascular, proliferating glandular tissue springing from its posterior wall. This tissue I rapidly removed with my fingers, washed out the cavity with hot borated water, sponged it dry, and filled it with a sac of iodoformed gauze loosely packed with sublimated gauze, having first stitched the cyst-wall to the abdominal wound as an extra precaution. The patient did perfectly well, and I should not have troubled the packing had I been experienced with this method. Although temperature and pulse were normal, I felt anxious about leaving the dressing too long, and hence removed it on the sixth day. I found it perfectly sweet and free from discoloration. It might have been left undisturbed another six days without danger, I am confident. Under loose packing with iodoformed gauze, the granulating cavity rapidly closed, the patient left her bed after the second week, and now,

three months after the operation, the cavity is nearly healed, the patient appearing in perfect health.

For adherent, non-removable cysts this method seems to me far preferable to the old plan of drainage-tubes and frequent irrigation. The *sine qua non* of success is, of course, scrupulous cleanliness and careful antisepsis.

And now we come to the last question under discussion:

5. *What substitute can be offered for drainage; or how can the necessity for its employment be averted?*

Inasmuch as drainage after laparotomy is always a prophylactic measure, a precaution against a longer septic infection from retention, secretion, and decomposition of fluids in the peritoneal cavity, which danger *may never* occur, the doubts naturally arise—first, whether that precaution is indeed *necessary*, and secondly, whether it cannot be averted by some other means than drainage.

Now, as to the *necessity* for prophylactic drainage, that is precisely the question under discussion, which I hope to see advanced to a solution by the opinions of the many authorities here present. While many operators regard drainage as indispensable whenever extensive adhesions, etc., promise subsequent oozing and secretion, others believe that thorough antisepsis during the operation and careful cleansing of the peritoneal cavity before closing it will enable us to dispense with drainage. I have quoted from both sides. Some think, and with reason, that the irritation of the tube itself produces serious discharge, which would not be present if the tube were omitted, and that this oozing is maintained as long as the tube remains in place. Some of the German operators have been taught by experience that large raw surfaces will agglutinate without appreciable secretion or oozing, if, after thorough antiseptic cleansing and arrest of hemorrhage, the surfaces are carefully laid against each other and kept in apposition by the weight of the intestines. I have seen Schroeder thus treat the raw sac of a large renal cyst which he enucleated (it was as large as an adult head), using no su-

tures, and rapid recovery took place. Martin does the same, I believe, and so does Olshausen, who goes even so far as to drop adherent portions of ovarian cysts.

Again, how many cases of previous or immediate rupture of ovarian cysts have occurred in which some of the cyst-fluid was inevitably left in the abdominal cavity in spite of the most careful sponging and irrigation, and the abdomen was completely closed? And still no septic infection set in and the patients recovered promptly.

Last spring I met with a typical illustration of this fact in a case of double ovariotomy during pregnancy, where both tumors were dermoid, the left one, a composite polycyst and dermoid, having ruptured months before and caused general chronic peritonitis. The last sponge passed into Douglass's pouch brought up viscid cyst-fluid; the large pregnant uterus prevented my using the only drainage-tubes I had with me (it was a case in a private house), which were of glass; and hence I decided to wash out the abdominal cavity with tepid 1 : 1000 boracic-acid solution freely poured in from a pitcher, and to completely close the wound. In spite of persistent vomiting from the anesthesia, and expulsion of the fetus on the third day, the patient made a perfect recovery, although there can be no doubt that there must have been considerable intra-peritoneal oozing from the irritated and inflamed peritoneum and the numerous adhesions.

Quite recently, also, did I find it advisable to remove the drainage-tube on the third day, although several ounces of slightly tinged serum were still removed from it (in one case, for reflex vomiting—above referred to—in the other, for tympanites and abdominal pain), and recovery went on rapidly in spite of the undoubted continuance of serous secretion for some time.

It would thus seem that a small quantity of pure blood or of bloody serum in the peritoneal cavity, if unmixed with pus or putrid matter or flocculi, is of no particular noxious import, *provided all possibility of septic infection from without has been prevented;* and that prophylactic drainage

in such cases is not only unnecessary, but by the irritation of the tube, and the chance of infection through its open mouth, adds a positive element of danger. Even in chronic ascites, where formerly permanent drainage after laparotomy was thought indispensable to a cure, the evacuation of the fluid with complete closure of the wound seems now to be considered sufficient.

There will probably always be a certain number of cases of laparotomy in which prudence will lead us to employ prophylactic drainage, such as the rupture of cysts with purulent, putrid, colloid, or dermoid contents, which can never be entirely removed from the abdominal cavity by sponging or irrigation—here the drainage-tube or gauze strip will suffice; further, adherent irremovable cysts of the ovary or broad ligament, where the gauze sac and packing is the best method; and finally, the presence of many sutures and ligatures after the removal of very vascular solid growths, as in hysterectomy, where chiefly Martin uses abdomino-vaginal drainage. But in those cases where hitherto drainage has been largely employed, of adhesions with slight bloody oozing and serous secretion, I think the drainage-tube can in future be safely dispensed with.

And when it appears desirable to drain, it has occurred to me that the antiseptic gauze strip might easily be pushed through the vaginal roof, and sufficient capillary drainage be thus secured with far less inconvenience, danger, and trouble in removal than accompanies the abdominal method. (A useful instrument for pushing the gauze through Douglas's pouch would be Cushing's pelvic abscess dilator.) The efficiency of this manner of drainage after vaginal hysterectomy, and the ease of removal of the gauze, would seem to recommend this method.

There are, however, two indispensable conditions to be observed if drainage is to be omitted, viz.:

1. The thorough cleansing of the peritoneal cavity of loose fluid, be it blood, cyst-contents, or serum. This is to be accomplished by careful, gentle sponging, and by protec-

tion of the abdominal viscera from injury by superimposed large sponges or sublimated gauze (which I have used with great satisfaction for the past year), or from becoming soiled during the suturing of the abdominal wound; and notably, by freely washing out the peritoneal cavity with a mild antiseptic solution, such as boracic acid 1:1000, or Thiersch's solution poured in from a pitcher held at an altitude of a foot or more, the intestines being held back by one hand, and the water gently squeezed out by the hands of the assistant pressing from above downward until the water flows out perfectly clean. The quantity of water thus poured in may vary from a quart to one or two gallons. The patient should be protected by properly-arranged rubber cloths.

2. The observance of universal and most scrupulous antisepsis in *every* respect (patient, operator, assistants, spectators, linen, sponges, instruments, room, atmosphere) during the whole operation. This antisepsis may be either according to the most approved modern principles, or, if the operator prefers, by means of the thorough enforcement of *cleanliness* in all its details.